ENERGY to care

Greater efficiency supports patient care.

Practice Preventive Maintenance of Major HVAC Equipment

All ECM content was independently developed and reviewed to be vendor, product and service provider-neutral.

Description

Establish regular and specific preventive maintenance schedules for all heating, ventilation and air conditioning (HVAC) equipment to optimize efficiency, maximize estimated useful life and maintain a level of indoor air quality that supports the well-being of patients, staff and visitors.

Project Talking Points

- Preventive maintenance enhances energy efficiency, and optimal efficiency often results in energy savings, thus reducing costs.
- Preventive maintenance extends the life of equipment by keeping it operating as designed. Preventive maintenance is less expensive than early replacement of equipment.
- A comprehensive preventive maintenance program increases compliance with The Joint Commission Environment of Care (EC) standards.
- Proactive scheduling of maintenance activities, rather than waiting until a disruption in service occurs, improves system reliability and reduces labor resources required to maintain systems and equipment.
- Preventive maintenance supports planning and budgeting for major component upgrades.
- Preventive maintenance can be performed with in-house maintenance staff or with trusted contractors.

Triple Bottom Line Benefits

- **Cost benefits:** Preventive maintenance extends the life of equipment, enhances efficiency and improves reliability. Some cost benefits are easier than others to quantify, but anticipated savings make the effort worthwhile.

- **Environmental benefits:** Reducing energy use always has an environmental benefit through reduction of emissions associated with energy production and delivery.

- **Social benefits:** Equipment down time, controllability and thermal comfort may be improved as a result of improvements made to equipment during preventive maintenance, which can enhance patient, visitor and staff experience.

Purchasing Considerations

ASHE AHA Data & Insights

- Establish standards for purchasing maintenance items, whether you plan on keeping a stock of standard items such as fan belts, light bulbs and filters or if the stock will be elsewhere and how to replenish the stock.
- Determine the specifications for all maintenance items so the person in charge of ordering will correctly purchase the needed items.

How-To

1. Engage purchasing to establish standards for stocking maintenance items, which items to purchase and when. If the decision is made to outsource preventive maintenance, set expectations with your preferred contractor.

2. Use a computerized maintenance management system (CMMS), one that is integrated into the building automation system (BAS), if possible, to manage the preventive maintenance program. The CMMS should ideally track and document inspections, meeting minutes and actions taken and trigger maintenance alerts.

3. Consult with the safety officer to assure that HVAC equipment that may be considered "critical" by The Joint Commission standards meets the required annual preventive maintenance standards and that maintenance is properly documented.

4. Develop a "systems narrative" of the building HVAC system, including heating, cooling, ventilation and building control systems. If available, use the facility's operations and maintenance (O&M) manual to document sequence of operations, efficiency goals, anticipated performance and system/equipment-specific training materials.

5. Develop a preventive maintenance plan and schedule, including a scheduled annual review of the overall preventive maintenance program.

6. Examples of preventive maintenance practices include:

    - Boilers: Cleaning, descaling and water treatment.
    - Cooling towers: Cleaning to maximize condenser performance.
    - Chillers: Removing calcium carbonate from copper tubing.
    - Water-cooled systems: Inspecting and testing for leaks; calibrating sensors. Consider opening and closing all valves on a regular interval. Validate that when commanded closed control valves are not leaking.
    - BAS: Use calibrated handheld devices to check the BAS sensors for accuracy. Check your building automation graphics for any sensors that appear to be reading incorrectly. Ensure actual valve and damper status matches the building management system (BMS).

7. Provide regular training for O&M personnel on how to calibrate and maintain HVAC equipment so that it operates at a level of efficiency in alignment with the design intent.

Case Studies

- **Howard Hughes Medical Institute, Chevy Chase, MD**

- The goal of preventive maintenance program is to assure that equipment meets or exceeds its expected life cycle without any major failures. Use the CARE routine: clean, adjust, repair, examine.
- Prioritize system maintenance based on how directly each piece of equipment supports critical facility functions. This hierarchy also informs calculations on the true cost of maintaining and replacing equipment.
- Regular training is essential to the success of the preventive maintenance program.

- **University of Alabama, Birmingham, AL**
  - The preventive maintenance program uses a computerized system to summarize weekly preventive maintenance tasks.
  - The preventive maintenance group is responsible for testing and fine-tuning HVAC equipment so that HVAC mechanics are available to respond to heating and cooling requests from building occupants.

Resources

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE): Because Temperature Matters: Maintaining Cooling Towers
- BetterBricks
  - O&M Best Practices, Cooling Towers
  - Maintenance Schedule for Cooling Towers
- Building Owners and Manager Association (BOMA): Preventive Maintenance: Best Practices to Maintain Efficient & Sustainable Buildings
- ENERGY STAR® Maintenance Checklist
- Energy University courses:
  - HVAC Thermodynamic States
  - Boiler Types and Opportunities for Energy Efficiency
  - Combustion Processes
  - Fan Systems I: Introduction to Fan Performance
  - Fan Systems II: Fan Types
  - Fan Systems III: Improving System Efficiency
  - Fan Systems IV: Improving System Efficiency
- Pacific Northwest National Lab: **Building Retuning Training**
- Portland Energy Conservation Operation and Maintenance Service Contracts
- U.S. Department of Energy:
  - Efficient Hospital Boilers Result in Financial, Environmental and Safety Payoffs
  - Hospitals Benefit By Improving Inefficient Chiller System
  - Hospitals Realize Fast Paybacks from Retrofits and O&M Solutions
  - Hospitals Realize Greatest Savings Through Formal Energy Management Program
  - Hospitals Save Energy and Money by Optimizing HVAC Performance
  - Operations & Maintenance Best Practices
- U.S. Department of the Interior, Bureau of Reclamation, Hydroelectric Research and Technical Services Group: Facilities Instructions, Standards, and Techniques Volume 4-1A: Maintenance Scheduling for Mechanical Equipment
- U.S. Environmental Protection Agency (EPA):ENERGY STAR Building Upgrade Manual

Regulations, Codes and Standards, Policies

- The American Society for Health Care Engineering (ASHE): Health Facility Commissioning Guidelines
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
  - Level 1: Walk-Through Analysis
  - Level 2: Energy Audit, Energy Survey and Analysis

ECM Descriptors

Energy

Category List:
- Building and maintenance
- Commissioning
- HVAC
- Operations

ECM Attributes:
- Optimize operations
- Repair or optimize existing systems

Improvement Type:
- Commission/retro-commission
- Retrofit/renovations
- New buildings
- O&M

Department:
- Engineering/facilities management